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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/071,471	02/08/2002	Paul A. Koning	42390P12137	9970

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Michael A. Bernadicou  
BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP  
Seventh Floor  
12400 Wilshire Boulevard  
Los Angeles, CA 90025-1030

EXAMINER

DUONG, THO V

ART UNIT	PAPER NUMBER
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3743

DATE MAILED: 01/15/2004

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Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/071,471

Applicant(s)

KONING ET AL. 

Examiner

Tho v Duong

Art Unit

3743 

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 12 December 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,3,5-17,19,26-28,30 and 31 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3,5-17,19,26-28,30 and 31 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. §§ 119 and 120**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All   b) ☐ Some \*   c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
- a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Response to Arguments***

Applicant's arguments with respect to claims 1,3,5-17,19, 26-27 and 30-31 have been considered but are moot in view of the new ground(s) of rejection. As regarding claim 28, the amended subject matter is still not disclosed in the specification.

### **Verification of the claimed subject matter.**

Applicant discloses on page 10, paragraph 28 in the specification that the total weight fusible filler can be in the range of approximately 60-90%. Applicant further discloses on page 12, paragraph 33, in the specification that in an alternate embodiment, a polymer matrix can be filled with a fusible material only, and the weight percentage of the fusible material is 60-95%. In claim 11, applicant is claiming the fusible material is 60-90% weight in the embodiment which the filler is a non-fusible core coated with fusible material. It appears to the examiner that the weight 60-90% of the fusible material is too high to use because in this embodiment, the fusible serves as a coating material only.

### ***Specification***

The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: the claimed subject matter of “the non-fusible particles are in a range of approximately 5-49% by weight of the total weight of the thermal interface material” in claim 12, “the thermal interface material is non-adhesive” in claim 28 and “a combined weight of the

Art Unit: 3743

fusible filler and the non-fusible particles is in a range of approximately 50-99% “ in claim 10 lack a proper antecedent basis from the specification. Regarding claim 10, the specification discloses this range only up to 95% instead of 99%.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 12 and 28 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. As regarding claim 12, the claimed subject matter of “the non-fusible particles are in a range of approximately 5-49% by weight” is not described in the specification. As regarding claim 28, the claimed subject matter of “the thermal interface material is non-adhesive” is not supported by the original disclosure. The original disclosure only describes in claim 7 and page 5, paragraph 11, in the specification that the binder material acts as an adhesive and there are no description of any material of the thermal interface material that make it non-adhesive.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

Art Unit: 3743

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claims 1,6,9-11 and 19 are rejected under 35 U.S.C. 102(a) as being anticipated by Koch et al. (US 6,207,300). Koch discloses (column 2, lines 33-42 and column 4, lines 38-49) a thermal interface material comprising a polymeric binder material; a fusible filler (nickel-base solder) randomly positioned with respect to the binder material; a plurality non-fusible particles (pulverulent alloy of nickel) which has higher melting temperature than the fusible filler, randomly positioned with respect to the binder material. Koch discloses that the average size of fusible filler is between 10 –50 microns, and the average size of fusible filler and the non-fusible filler is 0.5-2.5:1. Therefore, the claimed limitation of the non-fusible particles of approximately 25 microns is anticipated by Koch. Koch further discloses that the combined weight of the fusible and non-fusible filler is 80-95 wt. % of the thermal interface material, and the weight ratio between the fusible filler to the non-fusible filler is 2-6:1. Therefore, the weight percentage of the fusible filler over the thermal interface material can be calculated by:

Conditions: 95 Wt% of the combine weight is selected and the ratio of 6 between fusible and non-fusible is also selected.

Fusible wt. % =  $(95 * 6)/7 = 81.4$  wt. % of the thermal interface material.

Therefore, claim 11 is anticipated by Koch.

Claims 30-31 are rejected under 35 U.S.C. 102(b) as being anticipated by Kang et al. (US 6,114,413). Kang discloses (figures 1-3,5 and column 4, lines 28-36) a thermal interface

Art Unit: 3743

material, comprising a binder material (polymer); a fusible filler (Sn) randomly positioned with respect to the binder material; and a plurality of non-fusible particles such as copper, aluminum nitride or diamond wherein diamond is a non-electrically conductive material, randomly positioned with respect to the binder material.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1,3,5,6,7,8,9,10,15,16,17,19 and 26-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kang et al. (US 6,114,413) in view of Squitieri (US 4,869,954). Kang discloses (figures 1-3,5, column 2, lines 59-63 and column 4, lines 28-36) that a thermal interface material comprising a polymer paste material (polymer) acts as an adhesive; a fusible filler (Sn) coated onto a plurality of non-fusible particles (Cu) which has a sphere shape or a non-uniformly shape; and the pre-coated non-fusible particles randomly positioned within the binder material. Kang further discloses (column 6, lines 44-49) that the fusible filler can be Sn, In, Bi, Sb and their alloys while the non-fusible particles can be copper or diamond. It is well known in the art that tin has a melting point at 120C degrees; indium at 159C degrees and copper or diamond has thermal conductivity greater than the thermal conductivity of tin. As regarding claim 16, applicant discloses on page 11, paragraphs 31,32 that tin and indium selected to use as the claimed fusible material which has the claimed properties. Therefore, it is inherently that

Art Unit: 3743

either tin or indium disclosed in reference of Kang to have the property such as “stable to oxygen at temperature up to approximately 150C and relative humidity up to approximately 90%”.

Kang further discloses (column 6, lines 39-43 and claim 26) that the relative amount of the coated filler varies from 30 to 90% by weight of the thermal interface material. Kang substantially discloses all of applicant’s claimed invention as discussed above except for the limitation that a mean diameter for conductive fillers can be approximately 25 microns.

Squitieri discloses (column 3, line 66-column 4, line 28) a thermal interface materials having conductive fillers embedded within a binder, wherein the conductive fillers has a particle size from 1 micron to about 50 microns so as not to distort the surface of the thermal interface material. It would have been obvious to one having ordinary skill in the art at the time the invention was made to select the conductive filler’s size from 1 micron to about 50 microns so as not to distort the surface of the thermal interface material.

Claims 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kang Squitieri as applied to claims 1 and 3 above, and further in view of Koning (US 6,365,973). Kang and Squitieri substantially disclose all of applicant’s claimed invention as discussed above except for the limitations of volume ratio between the fusible filler to non-fusible particles. Koning discloses (figure 3 and column 3, line 20- column 4, line 25) a thermal interface material (138) that has fusible and non-fusible fillers embedded in a binder material wherein the volume ration between the fusible and the non-fusible particles is between 30-70% to ensure the fusible material being in the continuous phase so that a good electrical or heat transfer property of the thermal interface material is retained. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use Koning’s teaching in the combination device of

Art Unit: 3743

Kang and Squitieri to ensure the fusible material being in the continuous phase so that a good electrical or heat transfer property of the thermal interface material is retained.

***Conclusion***

The non-application of art against claims 12 and 28 should not be construed as an indication that the claims contain allowable subject matter.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Patterson et al. (US 5,213,715) discloses a directional conductive polymer having filler disposed inside a binder material.

Any inquiry concerning this communication or earlier communication from the examiner should be directed to Tho Duong whose telephone number is (703) 305-0768. The examiner can normally be reached on from 9:30-6 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Henry Bennet, can be reached on (703) 308-0101. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0861.



TD

January 8, 2004



Tho Duong

Patent Examiner.